



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>6</sup> :</b> <b>B05D 5/06, B44F 9/04, 9/02</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 97/05965</b> <b>(43) International Publication Date:</b> 20 February 1997 (20.02.97)
<b>(21) International Application Number:</b> PCT/EP96/03264 <b>(22) International Filing Date:</b> 24 July 1996 (24.07.96)  <b>(30) Priority Data:</b> VE95A000031 7 August 1995 (07.08.95) IT VE95A000050 23 November 1995 (23.11.95) IT  <b>(71) Applicant (for all designated States except US):</b> MIDA S.R.L. [IT/IT]; Via Zanardelli, 99, I-73100 Lecce (IT).  <b>(72) Inventor; and</b> <b>(75) Inventor/Applicant (for US only):</b> FLAMINIO, Mariaromano [IT/IT]; Viale Cicerone, 11, I-73020 Cavallino (IT).  <b>(74) Agent:</b> PIOVESANA, Paolo; Corso del Popolo, 70, I-30172 Venezia Mestre (IT).		<b>(81) Designated States:</b> AL, AM, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).  <b>Published</b> <i>With international search report.</i>
<b>(54) Title:</b> METHOD FOR COATING AND DECORATING SURFACES IN GENERAL  <b>(57) Abstract</b> <p>A method for coating surfaces in general, and decorating them with powders of various colours characterised by: applying to the surface to be decorated, previously treated for this application, a layer of powdered coating material of colour corresponding to the desired background for the decoration to be obtained, heating the surface treated in this manner to a temperature lower than the baking temperature of the powdered coating material, but sufficient to fix it to the surface to be decorated, applying to the surface prepared in this manner at least one powder of colour corresponding to the coloured motif to be reproduced, distributing it in accordance with the desired pattern of this motif, subjecting the surface treated in this manner to final baking for a time and at a temperature sufficient to securely fix said powder to said surface.</p>		

**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AM	Armenia	GB	United Kingdom	MW	Malawi
AT	Austria	GE	Georgia	MX	Mexico
AU	Australia	GN	Guinea	NE	Niger
BB	Barbados	GR	Greece	NL	Netherlands
BE	Belgium	HU	Hungary	NO	Norway
BF	Burkina Faso	IE	Ireland	NZ	New Zealand
BG	Bulgaria	IT	Italy	PL	Poland
BJ	Benin	JP	Japan	PT	Portugal
BR	Brazil	KE	Kenya	RO	Romania
BY	Belarus	KG	Kyrgyzstan	RU	Russian Federation
CA	Canada	KP	Democratic People's Republic of Korea	SD	Sudan
CF	Central African Republic	KR	Republic of Korea	SE	Sweden
CG	Congo	KZ	Kazakhstan	SG	Singapore
CH	Switzerland	LI	Liechtenstein	SI	Slovenia
CI	Côte d'Ivoire	LK	Sri Lanka	SK	Slovakia
CM	Cameroon	LR	Liberia	SN	Senegal
CN	China	LT	Lithuania	SZ	Swaziland
CS	Czechoslovakia	LU	Luxembourg	TD	Chad
CZ	Czech Republic	LV	Latvia	TG	Togo
DE	Germany	MC	Monaco	TJ	Tajikistan
DK	Denmark	MD	Republic of Moldova	TT	Trinidad and Tobago
EE	Estonia	MG	Madagascar	UA	Ukraine
ES	Spain	ML	Mali	UG	Uganda
FI	Finland			US	United States of America
FR	France				

## METHOD FOR COATING AND DECORATING SURFACES IN GENERAL

This invention relates to a method for coating surfaces in general and decorating them with powders of various colours.

The surfaces of natural materials, such as wood and marble, have an  
5 outer appearance which is very pleasing to the view. These natural materials have however numerous drawbacks such as high cost, an increasingly more limited availability due to environmental problems and often poor resistance to atmospheric agents.

In addition marble has the added drawbacks of considerable weight, as  
10 it can be formed only into slabs of a certain minimum thickness, and with only flat surfaces, unless further costly surface machining is undertaken.

To combine the aesthetic merits of these natural materials with low cost and a large variety of shapes and dimensions, it has already been proposed to decorate metal, plastic, ceramic and other surfaces to imitate  
15 these natural materials.

A known method of decoration is photofiliming, in which a powder or liquid coating forming the background colour is applied to the surface to be decorated, followed by the application thereon of a film reproducing the required decoration. This method has various drawbacks, including:

- 20 - high cost due both to the intrinsic cost of the materials and the cost of adapting a traditional coating plant,
- an unsatisfactory result from the aesthetic viewpoint due to the excessive uniformity of the decoration,

## 2

- limited resistance to atmospheric agents.

Another known decoration method is to apply a PVC covering to the surface concerned, and in particular to form by traditional methods a PVC film reproducing the desired decorations, in imitation of wood or marble, and to  
5 glue this film to the surface to be decorated.

This method has also proved unsatisfactory in that it also has numerous drawbacks, including:

- an aesthetic result which is not natural,
- a high final cost of the product obtained,
- 10 - limited resistance to atmospheric agents.

All these drawbacks are overcome by a method for coating and decorating with powders of various colours surfaces in general as described in claim 1.

A preferred embodiment of the present invention is described in  
15 greater detail hereinafter with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of a surface to be subjected to the treatment according to the invention;

Figure 2 shows it after the initial heating stage; and

20 Figure 3 shows it after final baking.

The method of the invention is applicable to any metal, ceramic, plastic, wood or glass surface to be decorated, in such a manner as to assume the typical appearance of a natural surface, such as wood or marble.

The surface 2 is firstly subjected to specific treatment depending on the nature of the surface to be decorated, but which in itself does not form part of the invention.

To the surface 2 treated in this manner there is then electrostatically applied a layer of powdered coating material 4, in particular of polyester, epoxy or epoxypolyester resins, of colour corresponding to the desired background colour for the decoration to be obtained. Polyester-hydroxyalkylamide resins, polyurethane resins, acrylic resins, epoxyacrylic resins, acrylopolymurethane resins or acrylopolymester resins can also be applied. After the powdered coating material 4 has been applied to the surface, it is heated to a temperature less than the baking temperature of said coating, but sufficient to cause it to fix to the surface to be decorated. Indicatively the heating temperature is about 75-90°C and can be achieved by providing, in a traditional powder coating line, pairs of catalytic heating panels, heating lamps, ultraviolet lamps, etc., between which the surface to be decorated is passed.

In the case of particular decorations for which one application stage and one heating stage for the coating layer are found to be insufficient, these two stages can be repeated.

After the heating stage, the purpose of which is to fix a layer of powdered coating material 4 to the surface to be decorated, a second powdered coating material 6 of colour corresponding to the coloured motif to be reproduced is applied to the surface prepared in this manner.

This second powdered coating material also preferably consists of the aforesaid resins.

The second powdered coating material 6 can be applied either as a suspension of the powder 6 in a slow-drying liquid vehicle, or can be applied  
5 in the dry state. In the first case a liquid of slow evaporation or a slow-drying acrylic liquid is preferably used, the powdered coating material 6 being mixed into this liquid to form a suspension. The suspension is then spread over the surface to be decorated with automatic or manual applicators which arrange the powdered coating material 6 in the required decorative pattern. In  
10 particular in reproducing the pattern of wood grains, because of the slow drying of the acrylic liquid, the decoration can also be modified by direct intervention of the operator, who can even produce the characteristic form of wood knots.

To solve special problems, intermediate treatments other than the  
15 application of powders and their heating can be provided.

If the powdered coating material 6 is applied dry, its application can be by various methods.

A first method consists of applying to the surface to be decorated a uniform layer of powder 6 and then removing the excessive portion so as to  
20 form the desired graining. This removal can be achieved either by suction or by a process of coordinated wiping by mechanically or manually operated tools, such as brushes, blades, pads, sponges etc.

In particular, a tool can consist of an automatic applicator formed from

a pair of cylindrical rotary pads with the surface worked according to the notif to be reproduced or rotary brushes sprayed with liquids and used for partially removing the excess quantity of powder, previously applied to the piece to be treated, to leave on its surface the particular decoration to be obtained.

5 A different method of applying the powder 6 is to use a sort of silkscreen stencil reproducing the required decorative pattern.

On termination of this stage, the entire assembly is baked, indicatively at 180°C for 20 minutes.

The result of this treatment is a surface having an outer appearance  
10 totally similar to the surfaces of natural materials, but with decidedly better characteristics than those obtainable by traditional methods.

Coating tearing tests, chequering tests and acetic salt-spray tests were carried out on samples of surfaces obtained in this manner and gave positive results. In particular, these latter tests exceeded more than 1000 hours without  
15 any formation of bubbles or blisters.

From the foregoing it is apparent that the method of the invention has numerous advantages, and in particular:

- it enables existing coating plants to be used, with only simple modifications,
- it achieves an aesthetically satisfying result to the extent of not revealing the  
20 artificial nature of the support,
- it presents optimum resistance to atmospheric agents,
- it is of low cost because of the use of low-cost materials,
- it enables surfaces of any geometry and area to be decorated,

- it enables the surfaces of small-thickness and hence low-weight supports to be decorated.

The method of the invention can be used for forming a large number of products, including:

- 5 - metal section bars for window frames with a wooden or marble outer appearance,
- metal plates for household electrical appliances with a wooden or marble outer appearance,
- chipboard or MDF panels for kitchens with a wooden or marble outer  
10 appearance,
- metal urban furniture elements with a wooden or marble outer appearance,
- metal sheets and section bars for use in the automobile, naval and aeronautical sectors.

It should be noted that in addition to the wooden or marble outer  
15 appearance, other appearances are possible comprising multiple coloration.

## C L A I M S

1. A method for coating surfaces in general, and decorating them with powders of various colour characterised by:
  - applying to the surface to be decorated, previously treated for this
  - 5 application, a layer of powdered coating material of colour corresponding to the desired background for the decoration to be obtained,
  - heating the surface treated in this manner to a temperature lower than the baking temperature of the powdered coating material, but sufficient to fix it to the surface to be decorated,
  - 10 - applying to the surface prepared in this manner at least one powder of colour corresponding to the coloured motif to be reproduced, distributing it in accordance with the desired pattern of this motif,
  - subjecting the surface treated in this manner to final baking for a time and at a temperature sufficient to securely fix said powder to said surface.
- 15 2. A method as claimed in claim 1, characterised in that before applying the powder of colour corresponding to the coloured motif to be reproduced, a further layer of powdered coating material corresponding to the desired background is applied and the surface treated in this manner is heated, said two stages being able to be repeated several times.
- 20 3. A method as claimed in claim 1, characterised in that the surface to be decorated is of metal, metal alloy, wood, glass, ceramic or plastic.
4. A method as claimed in claim 1, characterised by heating the surface to be decorated, covered with the layer of powdered coating material, to a

temperature of between 75 and 90°C.

5. A method as claimed in claim 1, characterised by passing the surface to be decorated, covered with the layer of powdered coating material, in front of a heat source provided in a powder coating line.
- 5 6. A method as claimed in claim 5, characterised by passing the surface to be decorated in front of an ultraviolet source.
7. A method as claimed in claim 5, characterised by passing the surface to be decorated in front of heating panels.
8. A method as claimed in claim 5, characterised by passing the surface  
10 to be decorated in front of heat lamps.
9. A method as claimed in claim 1, characterised in that a suspension of powdered coating material in a slow-drying liquid is applied to the surface already treated with powdered coating material and already subjected to heating.
- 15 10. A method as claimed in claim 9, characterised in that the slow-drying liquid is an acrylic compound.
11. A method as claimed in claim 9, characterised by using a suspension of powdered coating material in a slowly evaporating liquid.
12. A method as claimed in claim 1, characterised in that a coating  
20 material in the form of dry powder is applied to the surface already treated with powdered coating material and already subjected to heating.
13. A method as claimed in claim 12, characterised by applying to the surface a uniform layer of powdered coating material and then removing a part

of this latter, so that the remaining part forms the required decoration.

14. A method as claimed in claim 13, characterised by removing, by suction, part of the powder previously deposited on the surface to be decorated.

5 15. A method as claimed in claim 13, characterised by removing, by wiping, part of the powder previously deposited on the surface to be decorated.

16. A method as claimed in claim 15, characterised in that the wiping is effected under moist conditions.

10 17. A method as claimed in claim 15, characterised in that the removal of the powder by wiping is effected with a manually operated tool.

18. A method as claimed in claim 15, characterised in that the removal of the powder by wiping is effected with a mechanically operated tool.

15 19. A method as claimed in claim 13, characterised by applying the powdered coating material using a silkscreen stencil reproducing the pattern of the desired decorations.

20. A method as claimed in claim 1, characterised by using powdered coating materials in the form of polyester resins.

20 21. A method as claimed in claim 1, characterised by using powdered coating materials in the form of epoxy resins.

22. A method as claimed in claim 1, characterised by using powdered coating materials in the form of epoxypolyester resins.

23. A method as claimed in claim 1, characterised by using powdered

coating materials in the form of polyester-hydroxyalkylamide resins.

24. A method as claimed in claim 1, characterised by using powdered coating materials in the form of polyurethane resins.

25. A method as claimed in claim 1, characterised by using powdered  
5 coating materials in the form of acrylic resins.

26. A method as claimed in claim 1, characterised by using powdered coating materials in the form of epoxyacrylic resins.

27. A method as claimed in claim 1, characterised by using powdered coating materials in the form of acrylo-polyurethane resins.

10 28. A method as claimed in claim 1, characterised by using powdered coating materials in the form of acrylopolyester resins.

29. A method as claimed in claim 1, characterised by subjecting the surface to be treated to final baking at a temperature of 170-190°C for a time of 15-25 minutes.

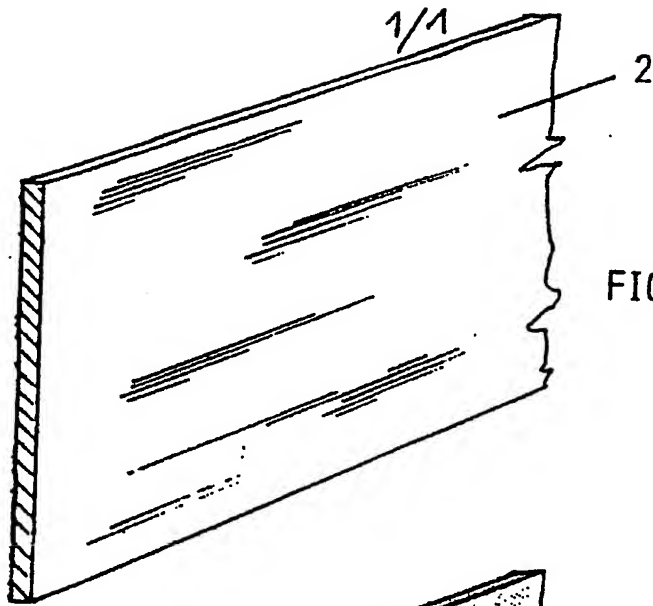


FIG. 1

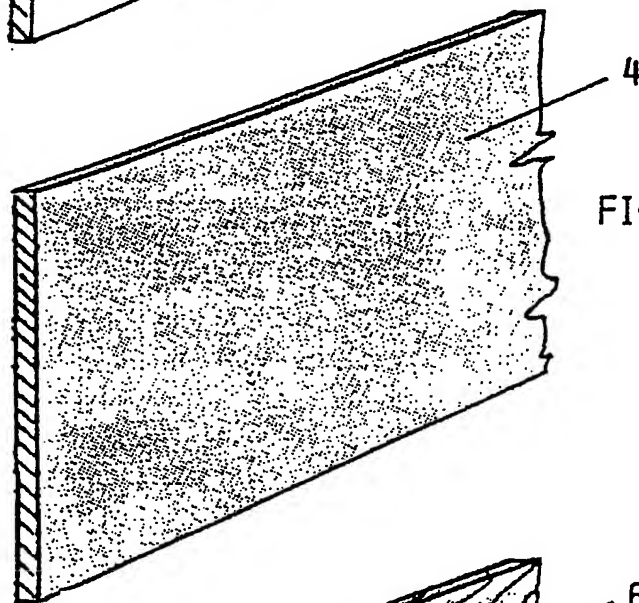


FIG. 2

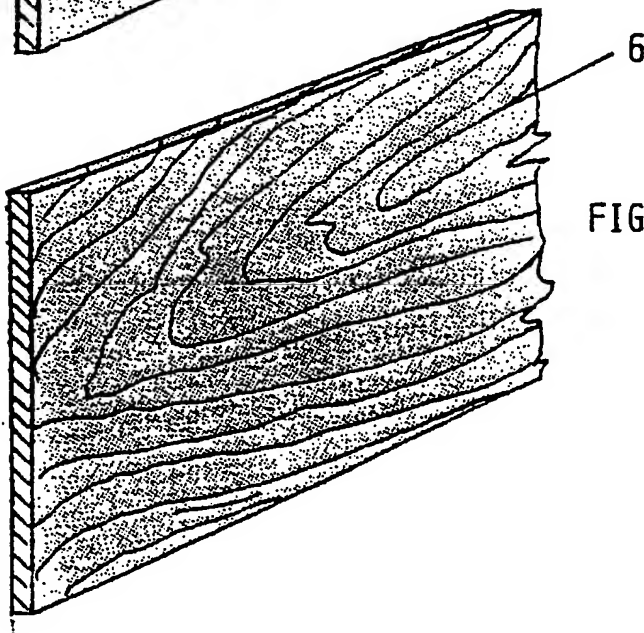


FIG. 3

## INTERNATIONAL SEARCH REPORT

PCT/EP 96/03264

A. CLASSIFICATION OF SUBJECT MATTER  
 IPC 6 B05D5/06 B44F9/04 B44F9/02

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
 IPC 6 B05D B44F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	FR,A,2 670 158 (EURO CREATION) 12 June 1992 see the whole document ---	1
A	EP,A,0 188 958 (SEB SA) 30 July 1986 see claims; examples ---	1
A	EP,A,0 121 748 (SIRS SOC INT REVETEMENTS SOL) 17 October 1984 see claims ---	1
A	GB,A,1 558 464 (METAL BOX CO LTD) 3 January 1980 ---	1
A	FR,A,2 340 140 (CANADA WIRE & CABLE CO LTD) 2 September 1977 see the whole document --- -/--	1

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

## \* Special categories of cited documents:

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

\*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

\*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

\*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

\*&\* document member of the same patent family

Date of the actual completion of the international search

27 November 1996

Date of mailing of the international search report

04. 12. 96

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
 NL - 2280 HV Rijswijk  
 Twl (+31-70) 340-2040. Tx. 31 651 epo nl,

Authorized officer

Brothier. J-A

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US,A,3 383 442 (MOUNTAIN GEORGE ROBERT) 14 May 1968 see claims ---	1
A	DE,A,44 19 197 (VOLKSWAGENWERK AG) 15 December 1994 see the whole document ---	1
A	FR,A,732 293 (LE MARMORIN JYDÉ) 15 September 1932 see the whole document ---	1
A	US,A,2 017 576 (W.C. WILSON) 15 October 1935 see the whole document -----	1,19

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR-A-2670158	12-06-92	NONE	
EP-A-0188958	30-07-86	FR-A- 2576253	25-07-86
		CA-A- 1233707	08-03-88
		EG-A- 18313	30-10-92
		HK-A- 9090	09-02-90
		JP-C- 1639270	18-02-92
		JP-B- 2061308	19-12-90
		JP-A- 61181573	14-08-86
		US-A- 4677000	30-06-87
EP-A-0121748	17-10-84	LU-A- 84688	17-11-83
		AU-B- 567330	19-11-87
		AU-A- 2542384	13-09-84
		BE-A- 899125	02-07-84
		CA-A- 1221279	05-05-87
		DE-A- 3472373	04-08-88
		FR-A- 2542260	14-09-84
		JP-B- 6057480	03-08-94
		JP-A- 59209117	27-11-84
		US-A- 4675216	23-06-87
GB-A-1558464	03-01-80	CA-A- 1103107	16-06-81
		JP-C- 1347491	13-11-86
		JP-A- 52017532	09-02-77
		JP-B- 61011674	04-04-86
		US-A- 4730575	15-03-88
FR-A-2340140	02-09-77	CA-A- 1039126	26-09-78
		DE-A- 2704755	11-08-77
		GB-A- 1535612	13-12-78
		JP-C- 1023505	28-11-80
		JP-A- 52115844	28-09-77
		JP-B- 55014711	18-04-80
		SE-B- 435342	24-09-84
		SE-A- 7701192	06-08-77
		US-A- 4104416	01-08-78
US-A-3383442	14-05-68	NONE	

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE-A-4419197	15-12-94	NONE	
FR-A-732293	15-09-32	NONE	
US-A-2017576	15-10-35	NONE	

**This Page is Inserted by IFW Indexing and Scanning  
Operations and is not part of the Official Record**

**BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ BLACK BORDERS
- ☒ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☐ FADED TEXT OR DRAWING
- ☐ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☐ SKEWED/SLANTED IMAGES
- ☒ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☒ LINES OR MARKS ON ORIGINAL DOCUMENT
- ☐ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: \_\_\_\_\_

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.**